GB1263932

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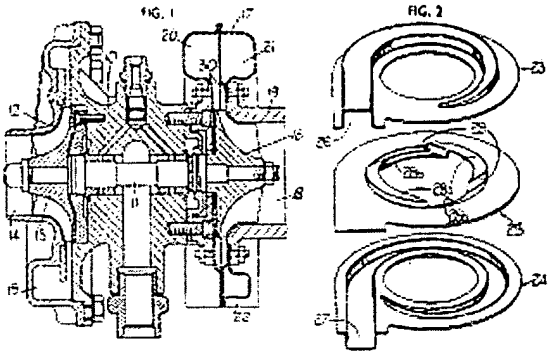
Abstract of **GB1263932**

1,263,932. Turbine casings. C.A.V. Ltd. June 27, 1969, No.32595. Heading F1T. The turbine casing 17 of an exhaust gas driven turbo-supercharger unit for an internal combustion engine comprises a pair of separately formed annular casing portions 23, 24 separated by a dividing plate 25 to define axially spaced passages 20, 21 for the supply of exhaust gas from respective cylinder banks of the engine to the turbine rotor 16. The passage 20 is formed by a channel 26 in casing portion 23, the channel having an initial tangential portion of substantially constant cross-section which merges into a circumferentially extending portion of decreasing cross-section. Passage 21 is similarly formed by a channel 27 in casing portion 24 but has a greater circumferential length than passage 20. The dividing plate 25 is generally flat but is deformed at 28a, 28b to provide pairs of alternate arcuate openings on to the periphery of the turbine rotor 16 from channels 26, 27 respectively. The deformed portions 28a, b are connected by tangential webs 29. The casing portions 23, 24 and plate 25 may be formed from sheet metal pressings which are then welded together to form the complete casing 17. Altern- atively they may be formed from ceramic material, such as silicon nitride, shaped by pressing in a mould or spraying on a detachable former, the portions then being joined together using a nitriding process. The complete casing 17 is secured to a turbine outlet duct 19 and to the body 10 of the turbo-supercharger unit by studs 30. The turbine 16 drives the supercharging compressor 13 through a shaft 11. (For Figures see next page)



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PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) TURBO SUPERCHARGERS

(71) We, C.A.V. LIMITED, a British Company, of Well Street, Birmingham 19, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the turbine casings of turbo superchargers of the kind intended for use with internal combustion engines, the turbine being of the radially inward flow type and the casing having a pair of inlets which in use, receive exhaust gases from two banks of engine cylinders respectively and the casing having passages which maintain the two streams of exhaust gases substantially separate until impingement of the gases upon the turbine has occurred.

The object of the invention is to provide such a turbine casing in a simple and convenient form.

According to the invention a turbine casing of the kind specified comprises in combination, a pair of generally annular outer casing portions and an annular dividing plate portion disposed between said casing portions, said casing portions and said dividing plate portion being formed separately and secured together to form the casing, each outer casing portion and one side of the dividing plate portion defining one of said passages and the dividing plate portion being shaped so that it defines with the outer casing portions, openings through which gases can flow onto the turbine rotor with one opening or alternate openings communicating with one of said passages whilst the other opening or openings communicate with the other of said passages.

In the accompanying drawings:—

Figure 1 is a sectional side elevation of one example of a turbo supercharger incorporating a turbine casing constructed in accordance with the invention and

Figure 2 is an exploded perspective view of the turbine casing shown in Figure 1.

With reference to Figure 1 of the drawings, the turbo supercharger comprises a body part 10 in which is journalled a rotary shaft 11. At one end of the shaft there is mounted the rotor 13 of a radial flow air compressor having a casing 12 which defines an air inlet 14 and a flow passage 15 which terminates in a tangential outlet (not shown). In use, the outlet is connected to the air inlet manifold of an associated engine.

At the other end of the shaft is mounted a turbine rotor 16 and secured to the body part is a turbine casing 17 to which is secured an outlet adaptor 19 which defines an outlet 18. In use, the adaptor is connected to an exhaust pipe of the associated engine installation. The turbine casing defines a pair of passages 20, 21 which extend from an inlet 22 and the passages act to guide exhaust gases onto the turbine wheel. In use, the exhaust gases drive the turbine rotor 16 and this in turn drives the compressor rotor 13 to supply air to the engine.

In order to make maximum use of the energy in the exhaust gases particularly at low speeds, the inlet is divided so that the two passages communicate with the exhaust ports of two banks of engine cylinders respectively. Moreover, the passages 20, 21 open alternately onto the periphery of the rotor so that the two streams of exhaust gases are kept separate until impingement of the gases upon the rotor of the turbine has occurred.

Turbine casings having divided passages for the flow of exhaust gases are known but in the past these have generally been produced as castings. Such castings are difficult to produce and in use, pose problems in so far that the usable temperature range is restricted. They can also be very heavy particularly when they form part of the turbo supercharger for a large engine.

The turbine casing forming the subject of the present application is shown in Figure 2 and comprises a pair of outer casing por-

tions 23, 24 and a dividing portion 25. Each of the portions is formed from thin sheet metal as a pressing and the three portions are welded together to form the casing. The resulting casing is very stiff and is able to withstand high temperature because the material from which it is formed is comparatively thin and can be formed from a material better able to withstand high temperature than the materials previously used which have had to be capable of being cast in a complex mould.

The casing portion 23 shown in Figure 2 is the portion of the casing which together with the dividing portion 25 defines the passage 20. The casing portion 23 is of generally annular form and defines a channel 26 which initially is straight and of substantially constant cross section but which then extends about the axis of rotation of the turbine rotor and gradually reduces in section. The outer and inner peripheral edges are not in the same plane this being seen more clearly in Figure 1.

The casing portion 24 together with the dividing portion 25 defines the passage 21 and the casing portions 23 and 24 are substantially identical to each other except that the channel 27 of the casing portion 24 has a longer circumferential length.

The dividing portion 25 is also of generally annular form and is flat except that adjacent its inner periphery it is deformed to provide alternate outlets from the passages 20, 21. The casing shown in the drawing is provided with four outlets from each passage, and these outlets are provided by pressing generally arcuate portions alternately on opposite sides of the plane of the dividing portion. The pressed generally arcuate portions are indicated at 28*a*, 28*b* and they are interconnected at their ends by webs 29 which extend in an axial direction but which are substantially tangentially disposed relative to the axis of rotation of the rotor. Moreover, the outer edges of the arcuate portions are connected to the main portion of the dividing member, and the axial length of the webs is substantially equal to twice the spacing between the planes containing the inner and outer peripheral edges of the outer casing portions and equal to the width at the entry of the turbine rotor.

When the portions are in assembled relationship the arcuate portions 28*a* close off the channel 26 of the outer casing portion 23 thereby to define a pair of openings between the arcuate portions 28*b* and the inner peripheral edge of the casing portion 23. These openings communicate with the channel 26. In like fashion the arcuate portions 28*b* close off the channel 27 of the outer casing portion 24 thereby to define a pair of openings between the arcuate portion 28*a* and the inner peripheral edge of the casing portion 24. These openings communicate with the channel 27.

The casing portions 23, 24 are secured to the dividing portion 25 by means of seam welding so as to ensure that leakage of gases between the passages 20, 21 and from the casing does not take place. The casing portions 23, 24 are provided with studs 30 whereby the casing 17 can be mounted on the body part 10 and whereby the adaptor 19 can be secured to the casing.

It will be appreciated that the dividing portion can be pressed so as to provide only one pair of openings or if desired more pairs of openings can be provided than the two pairs shown in the drawings.

As an alternative to sheet metal the portions can be formed from a ceramic material. Such a material can be silicon nitride and the portions can be formed by pressing the powdered ceramic material to the required shape in a mould. Alternatively the material can be sprayed onto a former from which the portion is subsequently detached. The portions can be joined to each other using a nitriding joining process.

The casing produced in accordance with the invention is extremely stiff in spite of the thin walls of the portions. It is lighter than casings formed by casting methods and because of the thin walls is better able to withstand high temperatures.

WHAT WE CLAIM IS:—

1. A turbine casing of the kind specified comprising in combination, a pair of generally annular outer casing portions and an annular dividing plate portion disposed between said casing portions, said casing portions and said dividing plate portion being formed separately and secured together to from the casing, each outer casing portion and one side of the dividing plate portion defining one of said passages and the dividing plate portion being shaped so that it defines with the outer casing portions, openings through which gases can flow onto the turbine rotor with one opening or alternate openings communicating with one of said passages whilst the other openings or openings communicate with the other of said passages.

2. A turbine casing as claimed in Claim 1 in which said passages are defined in part by channels formed in the outer casing portions respectively.

3. A turbine casing as claimed in Claim 1 in which said dividing plate portion is substantially flat but having adjacent its inner periphery generally arcuate portions disposed alternately on opposite sides of the plane of the plate portion, the adjacent ends of the arcuate portions being interconnected by webs.

4. A turbine casing as claimed in Claim 3 in which said webs extend in an axial direction but are tangentially disposed relative to an axis at right angles to the plane of the plate portion, and passing through the centre thereof.

5. A turbine casing as claimed in Claim 4 in which the axial length of the webs is substantially equal to twice the distance between the planes containing the inner and outer peripheral edges of the outer casing portions.

6. A turbine casing as claimed in Claim 5 in which said passages are defined in part by channels formed in the outer casing portions respectively.

7. A turbine casing as claimed in Claim 6 in which said passages extend from an inlet and initially have a tangential portion followed by a circumferential portion.

8. A turbine casing as claimed in Claim 7 in which said circumferential portions of the passages reduce in section as the distance from the inlet increases.

9. A turbine casing as claimed in Claim 8 in which said portions are secured together by seam welding.

10. A turbine casing as claimed in Claim 9 in which studs are secured to the outer casing portions whereby the casing can be mounted upon the body part of a turbo supercharger and an outlet adaptor can be secured to the casing.

11. A turbine casing as claimed in Claim 1 in which said portions are formed from a ceramic material formed to thin section.

12. A turbine casing as claimed in Claim 11 in which the portions of the casing are formed from silicon nitride and are secured together by a nitriding joining process.

13. A turbine casing as claimed in Claim 12 in which the portions are formed by pressing the ceramic material in a mould.

14. A turbine casing as claimed in Claim 12 in which the portions are formed by spraying the material onto a former from which the portion is subsequently detached.

15. A turbine casing as claimed in Claim 1 in which said outer casing portions and the annular dividing plate portion are formed as pressings from sheet material.

16. A turbine casing for a turbo supercharger and comprising the combination and arrangement of parts substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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1263932 COMPLETE SPECIFICATION
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Sheet 2

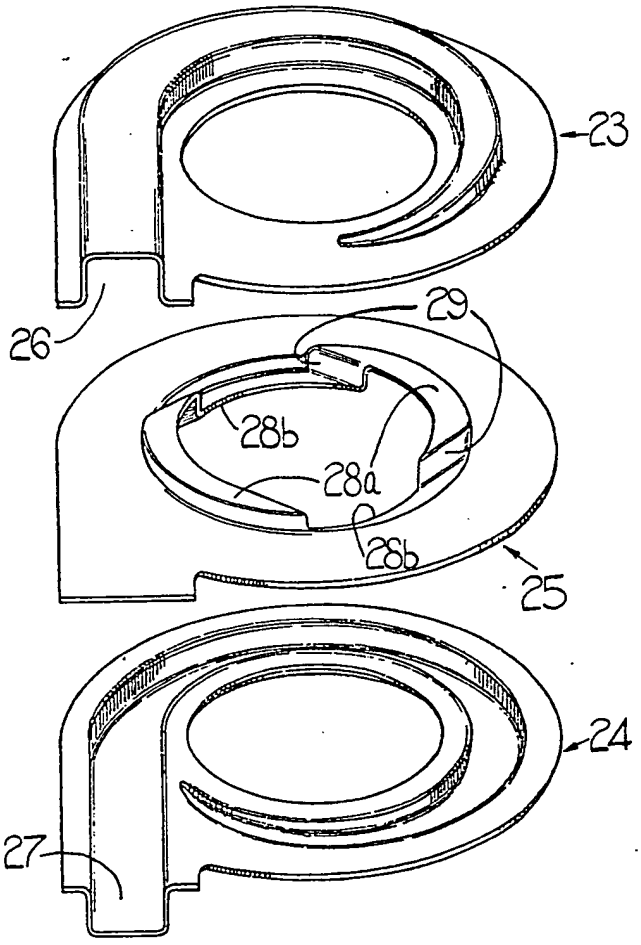

FIG.2.

1263932 COMPLETE SPECIFICATION

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Sheet 1

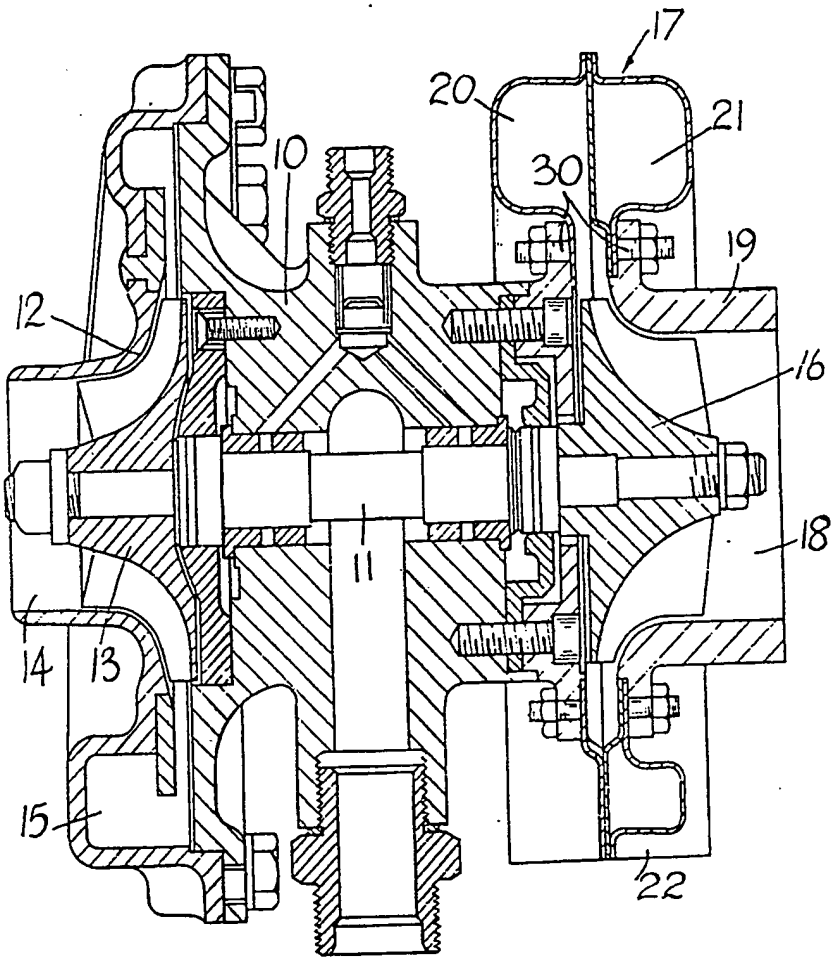

FIG.1.

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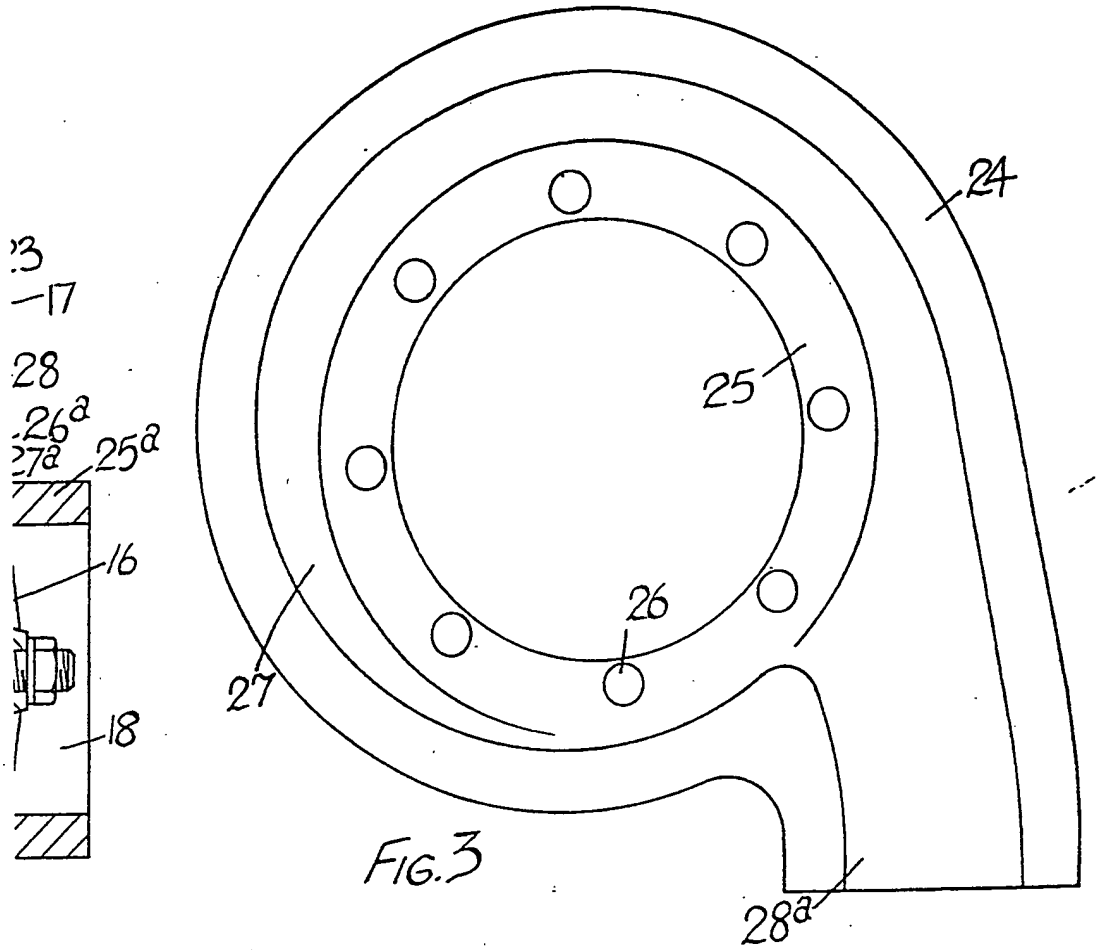

FIG.3

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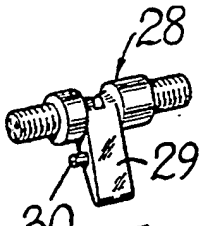

FIG.2

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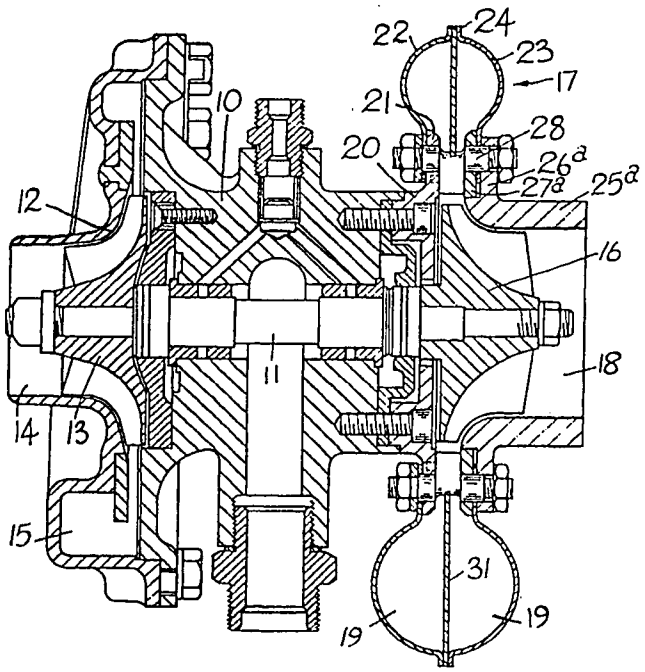

FIG.1.

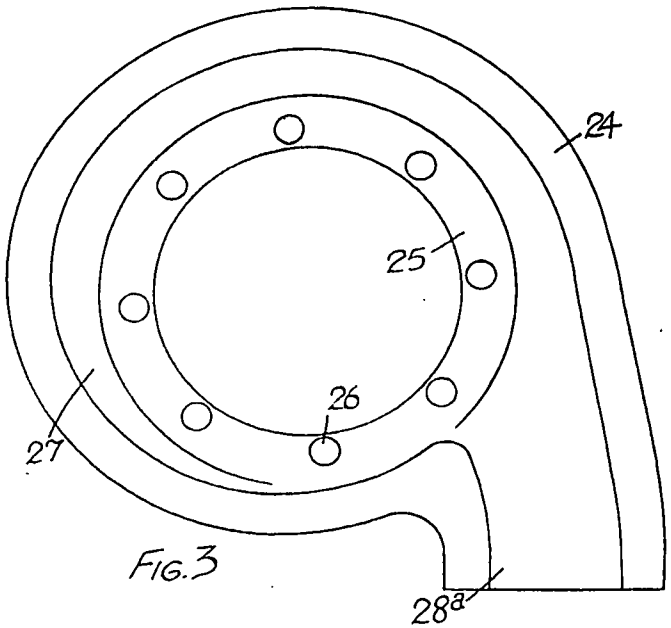

FIG.3

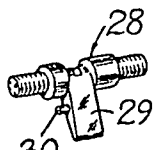

FIG.2